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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/10080

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC(7) : F16L 3/08, 3/12 US CL : 248/74.2, 74.3, 74.4, 68.1, 65, 316.7, 316.1, 49 According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) U.S. : 248/74.2, 74.3, 74.4, 68.1, 65, 316.7, 316.1, 49 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EAST		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y ✓	US 4,673,151 A (PELZ) 16 June 1987 (16.06.1987), see entire document.	1-4
Y ✓	US 5,277,006 A (RUSTER) 11 January 1994 (11.01.1994), see entire document.	1-4
Y ✓	US 4,248,459 A (PATE et al.) 03 February 1981 (03.02.1981), see entire document.	1-4
Y ✓	US 6,263,954 B1 (NAKAYAMA) 24 July 2001 (24.07.2001), see entire document.	1-4
Y ✓	US 5,248,119 A (IMURA) 28 September 1993 (28.09.1993), entire document.	1-4
Y ✓	US 1,549,142 A (MCKENZIE et al.) 11 August 1925 (11.09.1925), see entire document.	1-4
Y ✓	US 2,665,867 A (MCDONALD) 12 January 1954 (12.01.1954), see entire document.	1-4
Y ✓	US 3,584,348 A (SOLTYSIK) 15 June 1971 (15.06.1971), see entire document.	1-4
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "B" earlier application or patent published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 23 June 2003 (23.06.2003)		Date of mailing of the international search report 20 AUG 2003
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703)305-3230		Authorized officer Kimberly Wood  Telephone No. 703-308-2168